

**REMARKS**

Applicant appreciates the telephone conference with Examiner Vazquez on the above case where the measurement of plasma display protective layers was discussed with the scope of the current claims. The Examiner agreed that the amendments removed the functional issue in the claims. No agreement was reached on the allowability of the claims.

Applicant appreciates the Examiner's directions with regards to amending Claims 1, 3-5 and 7-10 to remove the purported functional language. Applicant has, accordingly, adopted the Examiner's suggestion and does not believe that this adds any new matter, and as noted by the Examiner it should now be considered a positive limitation in the claim structure.

As the Examiner is aware, our present invention is directed to an insulating film measuring device to enable the measurement of the depositing of magnesium oxide as a protective insulating film with charge retention capabilities for emitting secondary electrons in a plasma display panel.

Thus, Claim 5 provides a measuring device for evaluating properties of the insulating film and includes an ion radiation unit for irradiating the insulating film with ions, a voltage applying unit configured to apply a negative voltage to the insulating film during the irradiation, and a spectrum measurement unit measuring a spectrum of secondary electrons emitted from the insulating film during the ion irradiation, thereby permitting an evaluation of the properties of the insulating film and its suitability for use, for example, on a plasma display panel.

Our insulating film measuring device measures "secondary electrons emitted from the Insulating film," as described in Claim 5. "Secondary electrons" refer to electrons emitted from atoms included in a specimen when a part of an incident ray collides with the atoms and gives energy to the electrons. The atoms are emitted when a value of the given energy is more than a

predetermined value. In the insulating film measuring device” of the present invention, when the ion radiation unit irradiates the insulating film with ions, some electrons on the surface of the insulating film shift toward the ions. This shift generates energy, which causes the other electrons on the surface of the insulating film to be excited and emitted outside as the second electrons.

In a plasma display panel there is a requirement of writing an image pattern into an array of discharge cells with a minimum use of power and then sustaining a series of discharges to provide a gray scale.

A protective layer of MgO, for example, must prevent erosion over the life of the display panel while maintaining an acceptable charge to lower the applied voltage to the electrode necessary to sustain a series of discharges. Thus, the MgO insulating properties must be able to contribute a sustaining charge and an emission of electrons from the electrodes to trigger a discharge of UV energy in the plasma to excite the phosphor layers to provide a visible light for a color display from the pixel cells.

The spectrum measurement unit measures the spectrum of the secondary electrons. The result of the measurement (spectrum of the secondary electrons) is suitable for evaluating secondary electron emission characteristics and such.

This point is described as follows in the first embodiment, of the present application, at Page 16, Lines 7-17 as follows:

“As seen in Figures 3B and 3C, though after irradiation has, stopped no secondary electron peak due to kinetic emission appears in the secondary electron spectrum, a secondary electron peak is observed in a low energy level region.

Low energy level secondary electron peaks observed in this way, either during or after irradiation, strongly relate to a capability of an insulating film to emit secondary electrons from its valence bands. Hence, it is possible for the analyzing device 200; to carry analysis over time of the low energy level peaks of

the type shown in Figure 3A to 3C, and find indicators (evaluation values) for evaluating the properties of the insulating film.

Such evaluation values are considered to be effective as indicators for showing the charge characteristics and valence band electron emission characteristics of an insulating film.

The Office Action repeated its earlier rejection of Claims 5-8 as being completely anticipated by *Larson et al.* (U.S. Patent No. 5,315,113) verbatim. However, in the *Larson et al.* reference, the second detector 88 detects only electrons that are generated by irradiating the specimen with x-rays, as described in Column; 8, Lines 31-39. Also, as described in Column 8, Lines 59-61, the device of *Larson et al.* irradiates the specimen with electrons in order to neutralize the loss of photoelectrons emitted from a specimen by the x-rays, and not in order to emit secondary electrons from insulators.

The Final Office Action at Page 3, Lines 10-16, asserts that the character 98 in Figure 1 of *Larson et al.* denotes an ion irradiating unit, and the character 100 denotes ions. However, the character 98 actually denotes an electron gun and the character 100 denotes electrons, as clearly disclosed by *Larson et al.* in Column 18, Lines 54-57.

Therefore, *Larson et al.* does not disclose the characteristics of “measuring a spectrum of secondary electrons emitted from the insulating film which has been irradiated with ions.” Also, *Larson et al.* does not disclose the characteristics of Claim 5 of the present invention, namely “measuring a spectrum of secondary electrons emitted from the insulating film after ion irradiation has stopped.” Furthermore, *Larson et al.* does not, disclose the characteristics of “evaluating the properties of the insulating film,” which is an advantageous effect of the present invention.

“An anticipating reference must describe the patented subject matter with sufficient clarity and detail to establish that the subject matter existed in

the prior art and that such existence would be recognized by persons of ordinary skill in the field of the invention.” See *In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990); *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 675, 678, 7 USPQ2d 1315, 1317 (Fed. Cir. 1988).

It is respectfully submitted that the *Larson et al.* reference does not qualify as an anticipating reference and that the additional limitations in Claims 6-8 that are dependent from Claim 5, also are not taught nor anticipated over the *Larson et al.* reference.

The Office Action also rejected Claims 1-4, 9-10, 13 and 26 as being unpatentable over a combination of the *Larson et al.* reference when taken in view of the previously cited *Wada et al. et al.* (U.S. Patent No. 5,723,367).

The Office Action acknowledged that *Larson et al.* failed to teach a voltage applying unit configured to apply a negative voltage to an insulating film during ion irradiation. The Office Action contended, however, that Figures 1E and 2 of *Wada et al. et al.* taught a voltage applying unit for applying a negative voltage to an insulating film.

Our respective independent Claims 1 and 13 define the following elements.

Claim 1 describes an insulating film measuring device for evaluating properties of an insulating film, the insulating film measuring device comprising:

an ion irradiating unit configured to irradiate the insulating film with ions;

a voltage applying unit configured to apply a negative voltage to the insulating film during; ion irradiation; and

a spectrum measurement unit measuring a spectrum of secondary electrons emitted from the insulating film during ion irradiation.

Claim 13 describes an insulating film measuring method used for evaluating properties of an insulating film, the insulating film measuring method comprising:

an ion irradiation step of irradiating the insulating film with ions; and

a spectrum measurement step of measuring, at least one of during and after the ion irradiation, a spectrum of secondary electrons emitted from the insulating film while a negative voltage is applied to the insulating film.

Each of Claims 1 and 13 includes a characteristic of measuring “a spectrum of secondary electrons emitted from the insulating film, as seen in Claim 5 described above. However, *Larson et al.* does not disclose the characteristic of measuring a spectrum of secondary electrons emitted from an insulating film.

The Final Office Action (Page 5, Lines 11-13) asserts that *Wada et al.* discloses the characteristics of applying a negative voltage to an insulating film.

However, Claim 1 and Claim 13 both have “an ion irradiating unit irradiating the insulating film with ions” and “a voltage applying unit configured to apply a negative voltage to the insulating film during ion irradiation,” as the structural characteristics. This means that, in the present invention, an insulator is targeted for irradiation with ions, and a negative voltage is applied to the target.

The *Wada et al.* reference includes a description of applying a negative voltage to a silicon substrate 11, in Figure 2, and Column 9, Lines 35-40. However, this silicon substrate is not a target for irradiation with Ar ions. As described in Column 9, Lines 40-45, the target of the sputtering device shown in Figure 2 is a sputtering target 4. When the sputtering target 4 is irradiated with Ar which is used as a sputtering gas, Al included in the target is deposited on the silicon substrate to form an Al film. In Figure 2, a negative voltage is also applied to the sputtering target 4. However, the sputtering target 4 is not an insulator as the main component thereof is Al, as described in Column 9, Lines 40-45.

This means that *Wada et al.* does not disclose the characteristics of applying a negative voltage to a target for irradiation with ions.

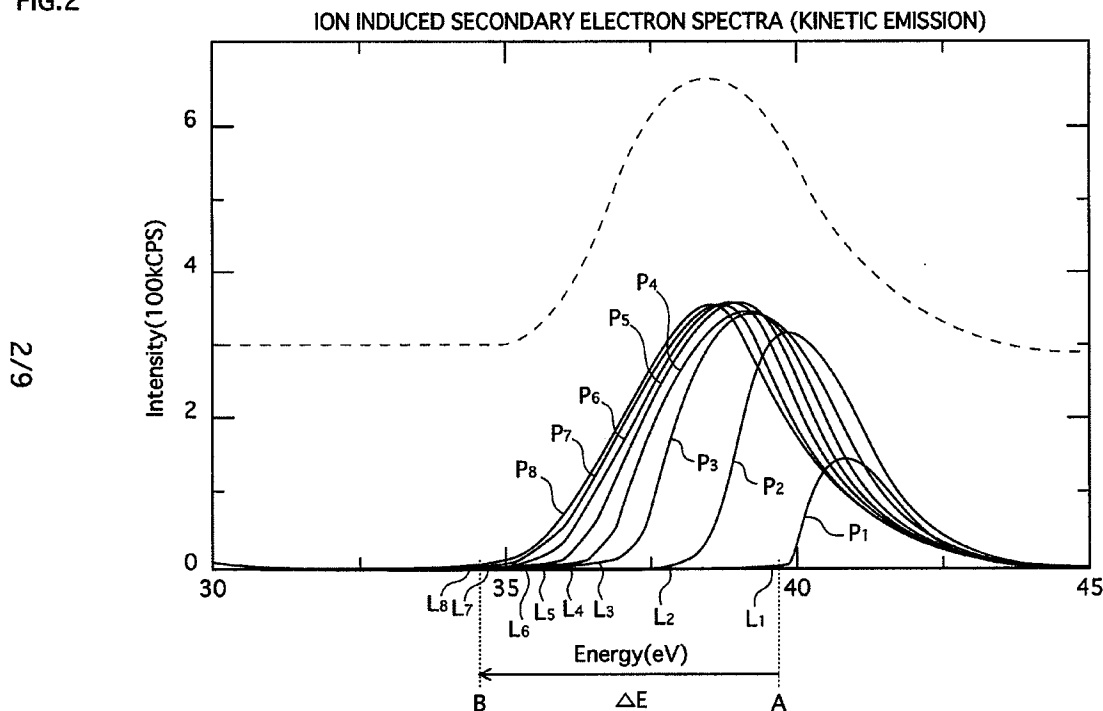
The Office Action asserts that *Wada et al.* includes a description of applying a negative voltage to an insulator. *Wada et al.* does not describe a structure in which a negative voltage is applied to an insulating film targeted for irradiation with ions, as described in the present invention.

The following explains an advantageous effect of the invention as described in Claim 13, which is achieved by combining the characteristics in which the insulating film is irradiated with ions and the characteristics in which a negative voltage is applied to the insulating film during ion irradiation.

In the present invention, a spectrum measurement unit detects secondary electrons that are emitted when the insulating film is irradiated with ions. The spectrum measurement unit performs the detection in accordance to the energy of the secondary electrons.

In the beginning of the ion irradiation, the surface of the insulating layer has a relatively small charge. Therefore, the energy of the emitted secondary electrons are maintained until reaching the spectrum measurement unit. As a result, the spectrum measurement unit detects, for example, a peak P1 of a secondary electron having a high energy, as shown by spectra of secondary electrons in Figure 2 as follows:

FIG.2



When the ion irradiation continues, the surface of the insulating film is positively charged since numerous secondary electrons are emitted. When the surface of the insulating film is positively charged, the distribution of the energy of the emitted secondary electrons is influenced by the positive charge on the surface. As a result, the energy of the emitted secondary electrons detected by the spectrum measurement unit becomes small.

In this way, when the energy distribution of the spectrum shifts toward a lower energy, detection becomes difficult. However, in the present invention, the energy of the emitted secondary electrons is biased since a negative voltage is applied to the insulating film. Therefore, even if the energy distribution of the spectrum shifts toward a lower energy, the spectrum still has enough energy to reach the spectrum measurement unit, which makes it

possible to detect a spectrum whose peak position shifts over time, as seen above in peak P2, P3, ..., P8 in Figure 2.

The Office Action only pointed out that *Wada et al.* discloses a structure in which a negative voltage is applied to an insulator that is not a target for ion irradiation, and does not provide any rationale for any combination of *Wada et al.* and *Larson et al.*

Furthermore, neither *Wada et al.* nor *Larson et al.* discloses a structure in which a negative voltage is applied to the insulating film while the insulating film is irradiated with ions, so that the spectrum measurement unit can detect the spectrum whose peak position shifts over time. Therefore, the advantageous effect of the invention cannot be anticipated by a combination of *Wada et al.* and *Larson et al.*

Our recent discussion with Pinchus Laufer in the Office of Patent Legal Administration, who was involved in writing the Examination Guidelines for Determining Obviousness under 35 USC §103 in view of the Supreme Court decision in *KSR International Co. vs. Teleflex, Inc.* verified that the KSR decision still required a specific rationale that could not be based on hindsight for purportedly combining the elements in the prior art to meet an invention defined in the patent claims.

Mr. Laufer incorporated the following from the existing MPEP into the Guidelines.

As noted in the MPEP at §2143.02:

A rationale to support a conclusion that a claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art. *KSR International Co. v. Teleflex Inc.*, 550 U.S. \_\_\_, \_\_\_, 82 USPQ2d 1385, 1395 (2007); *Sakraida v. AG Pro, Inc.*, 425 U.S. 273, 282, 189 USPQ 449, 453 (1976); *Anderson's-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57, 62-63, 163 USPQ 673, 675 (1969); *Great*



*Atlantic & P. Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147,  
152, 87 USPQ 303, 306 (1950). (underline added)

As can be readily appreciated, the function of the *Larson et al.* reference was to teach a surface analysis instrument utilizing electron beams to generate x-rays of a particular energy band such as aluminum K-alpha line. The electron gun was focused on a target anode of metal such as aluminum having the desired small energy bandwidth. The electron gun 98 disclosed in *Larson et al.* is simply a flood gun balancer to neutralize the specimen surface to eliminate any influence of a buildup of charge.

Thus, the function of *Larson et al.* was measuring the energy peaks or lines that are characteristic of a specific chemical species and not measuring the emission properties of an insulating film.

The *Wada et al.* reference had a function of forming a wire pattern on a silicon substrate with the capability of having connection holes or via holes to encourage the flow of deposited aluminum. Combining these two functions would have not produced the unusual and unexpected result that was achieved by our present invention.

Claim 14 was further rejected as being obvious over a combination of *Larson et al.*, *Wada et al.* and *Nakanishi et al.* (U.S. Patent No. 5,834,791).

*Nakanishi et al.* was cited for its disclosure in Figure 3 of an electron density of states being measured in valence bands. *Nakanishi et al.*, however, taught to a person of ordinary skill, the function of providing a semiconductor device that is capable of producing "highly spin-polarized electronic beam."

Thus, *Nakanishi et al.* simply would define to a person of ordinary skill that electronic density states can vary in a valence band. Combining this disclosure with *Larson et al.* and *Wada et al.* still would not meet specific requirements of MPEP §2143.02.

Claims 27 and 29-31 are held to be obvious over *Larson et al.* in view of *Wada et al.*, when taken further in view of *Hamamura et al.* (U.S. Patent No. 6,303,932).

The Office Action contended it would be obvious to apply a vacuum to an insulating film as taught by the *Hamamura et al.* reference to avoid any damage to the film and to secure it to a test structure.

*Hamamura et al.*, however, is directed to providing a high resolution image of a specimen in real time based on a secondary electron or secondary ion emitted from a specimen while it is being irrigated by a focus charge particle beam. There is no disclosure of how this function would be integrated into either *Larson et al.* or how a hypothetical combination of *Larson et al.* and *Wada et al.* disclosures could teach the features of our currently claimed invention.

*Hamamura et al.* is seeking to determine an image of a specimen whose function would not be integrated to yield the current invention.

Finally, Claim 28 was rejected over a combination of *Larson et al.*, *Hamamura et al.* when further taken in view of *Fries* (U.S. Patent No. 6,764,796).

As previously mentioned in the prior Office Action response, *Fries* teaches an insulating film in a photo lithography system where a plasma display is utilized to create micro and macro three dimensional structures. This is the express function that would be found by the teachings of *Fries* to a person of ordinary skill in our art. As such, there has been no rationale provided as

to how these functions could be incorporated into the principal *Larson et al.* or the *Hamamura et al.* reference.

The *Larson et al.* reference suggests a secondary emission detector for imaging purposes alone and focuses its specific bandwidth of a metal (aluminum) alpha line of x-ray energy to determine a chemical composition of the sample. *Fries* wishes to create micro and macro three dimensional images in photo lithography and *Hamamura et al.* wishes to provide a high resolution image of a specimen in real time.

Combining these references would not reduce our claimed invention and there is no rationale other than in hindsight from our current specification, as to why these references would be selected.

On Page 4, Lines 8-13 and Page 6, Lines 8-13 of the Final Office Action, there is a contention that the analyzing portion of *Larson et al.* discloses the basic structure of our present invention and there is a contention in parentheses as to the rationale relied upon in formulating a current rejection as follows:

...(secondary electrons emitted by insulating film have a lower energy level due to their kinetic energy because the electrons lose energy levels when they are reflected from the insulating film to the spectrum measurement unit, therefore is possible for the variation detection unit to detect a variation based on the energy level and the kinetic emission and for the intensity detection unit to detect the intensity based in the energy).

Applicant respectfully traverses the assumption that “because the electrons lose energy levels when they (electrons 100) are reflected from the insulating film.”

However, “reflected electrons” generally refer to “electrons emitted to the surface of a specimen in which the electrons have entered, the emission of the electrons being caused by a part of incident light being dispersed in the specimen due to the elasticity or the anelasticity.”

Therefore, the energy loss caused by the reflection of the electrons on the insulating film may be one of the reasons why the peak of the secondary spectrum forms a parabolic curve, but cannot be a reason for the shift of the peak position of the secondary-electron spectrum.

Regarding the device described in Claims 3 and 4 in the present invention, the reason why the spectrum peak shifts toward lower energy over time is because, as described in the section (2) above, “when the surface of the insulating film is positively charged due to the ion irradiation, the distribution of the energy of the emitted secondary electrons becomes small due to the positive charge on the surface.” Therefore, we believe that the reason provided by the Examiner, namely “the energy loss of the electrons at the time of reflection,” is inappropriate for the reason for the shift of the spectrum peak.

As described above, the energy loss of the electrons at the time of reflection, which is mentioned in relation to the *Larson et al.* reference, is irrelevant to,

- (i) “the shift of the secondary-electron spectrum peak toward lower energy over time” that is related to Claims 3 and 4 in the present invention and
- (ii) “the intensity of a peak, appearing at a lower energy level than a peak due to the kinetic emission of secondary electrons” that is related to Claims 7 and 8.

The Office Action used a rationale that the thickness of the film varies, therefore, each irradiation of electrons will have an amount of energy that is different from the other and thus, can show a difference between the secondary electrons based both on a time and kinetic energy, thereby allowing a determining of the chain in energy by comparing their respective peaks.

This was purportedly based upon the *Larson et al.* disclosure in Figure 1 of a processor having an analyzing portion to measure a conveyance time and a shift amount of change in energy.

Applicant respectfully traverses this assumption and would request substantiation of its premise if the present rejection is maintained. The thickness of an insulating film does not affect the change of energy of the irradiating electrons.

An insulating film is made of a material that does not easily conduct electrons. Therefore, in the present invention, the excitation of electrons by ion irradiation is assumed to occur on the surface of the insulating film. This means that the thickness of the insulating film and the energy of electrons have no relationship with each other, and “two spectra that each have a different peak from the other,” which is defined in Claim 10 of the present invention, cannot be measured although the thickness of the insulating film changes.

Because of the above-described reasons, we believe that *Larson et al.* does not disclose the characteristics defined in Claims 10, 29, and 31 of the present invention.

Applicant believes that their current claims meet the requirements of 37 CFR §1.116 in narrowing issues for purposes of appeal, and more importantly, for providing allowable subject matter that should place this case in condition for allowance. Applicant contends that a person of ordinary skill in our art at the time of our invention, would have not brought out these references and combined them in a manner set forth in the rejection except in hindsight from our present application.

As noted in *ex parte Rinkevich et al.*, Appeal 207-1317, May 29, 2007 at Page 9:

We note that the U.S. Supreme Court recently reaffirmed that “[a] factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautions of argument reliant upon *ex post* reasoning.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 82 USPQ2d at 1397. *See also Graham v. John Deere Co.*, 383 U.S. at 36, 148 USPQ at 474. Nevertheless, in *KSR* the Supreme Court also qualified the issue of hindsight by stating that “[r]igid preventative rules that deny factfinders recourse to common sense, however, are neither necessary under our case law nor consistent with it.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S. Ct. 1727,

82 USPQ2d at 1397. In the instant case, we conclude that a person of ordinary skill in the art *having common sense* at the time of the invention would not have reasonably looked to Wu to solve a problem already solved by Savill. Therefore, we agree with Appellants that the Examiner has impermissibly used the instant claims as a guide or roadmap in formulating the rejection.

It is believed the case is now in condition for allowance and an early notification of the same is requested.

Pursuant to 37 CFR §1.116 the amendment to the claims removes an issue and places the case in condition for allowance.

If the Examiner believes a telephone interview will help further the prosecution of this case, the undersigned attorney can be contacted at the listed telephone number.

Very truly yours,

**SNELL & WILMER L.L.P.**



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